Claims

Claims 1-7 (canceled)

Claim **8**. (currently amended) A method to determine the angle β of the second chamber (6) of the improved refractometer cell (9) of Claim **12** when the ~~cell~~ refractive index n_g of the transparent material of said cell is known, comprising the steps of

A. preparing a ~~solution~~ fluid whose refractive index n_1 is known;

B. filling both chambers of said refractometer cell with said fluid;

C. illuminating the cell with a fine beam of light whose vacuum wavelength λ_0 is known,

D. measuring the angle of deflection ψ of the transmitted beam

E. calculating β from the relation

$$\sin(\psi)=\frac{n_1\sqrt{2}}{2}\left\{\left[1-\left(\sin^2(\beta)(1-\left(\frac{n_g}{n_1}\right)^2 f^2)-2\sin(\beta)\cos(\beta)\left(\frac{n_g}{n_1}\right)f\left(1-\left(\frac{n_g}{n_1}\right)^2 f^2\right)^{\frac{1}{2}}+\cos^2(\beta)\left(\frac{n_g}{n_1}\right)^2 f^2\right)\right]^{\frac{1}{2}}\right.$$

$$\left.-\left(\frac{n_2}{n_1}\right)\left[\sin(\beta)\left(1-\left(\frac{n_g}{n_1}\right)^2 f^2\right)^{\frac{1}{2}}-\cos(\beta)\left(\frac{n_g}{n_1}\right)f\right]\right\}$$

where

$$f=\sin(2\beta)g-\cos(2\beta)\left(1-g^2\right)^{\frac{1}{2}} \text{ and } g=\left(\frac{n_1}{n_g}\right)\{\cos(\beta)-\sin(\beta)\}\frac{\sqrt{2}}{2}.$$

Claim **9**. (original) The method of Claim **8** for the case when $\beta \approx 45°$ and n_g is known and said angle β is determined from $\beta=\dfrac{\sin\psi}{2(n_g-n_1)}+\dfrac{\pi}{4}$ where said measured deflection angle is ψ.

Claim **10**. (currently amended) A method for measuring the refractive index of a ~~liquid~~ fluid using the improved refractometer cell of Claim **12** comprising the steps of

A. filling both chambers of said cell with said ~~liquid~~ fluid;

B. passing a fine beam of light therethrough;

C. measuring the deflection angle ψ of the emerging beam;

D. calculating said refractive index n_1 from the relation

$$\sin(\psi)=\frac{n_1\sqrt{2}}{2}\left\{\left[1-\left(\sin^2(\beta)(1-\left(\frac{n_g}{n_1}\right)^2 f^2)-2\sin(\beta)\cos(\beta)\left(\frac{n_g}{n_1}\right)f\left(1-\left(\frac{n_g}{n_1}\right)^2 f^2\right)^{\frac{1}{2}}+\cos^2(\beta)\left(\frac{n_g}{n_1}\right)^2 f^2\right)\right]^{\frac{1}{2}}\right.$$

$$\left.-\left(\frac{n_2}{n_1}\right)\left[\sin(\beta)\left(1-\left(\frac{n_g}{n_1}\right)^2 f^2\right)^{\frac{1}{2}}-\cos(\beta)\left(\frac{n_g}{n_1}\right)f\right]\right\}$$

where $f=\sin(2\beta)g-\cos(2\beta)\left(1-g^2\right)^{\frac{1}{2}}$ and $g=\left(\frac{n_1}{n_g}\right)\{\cos(\beta)-\sin(\beta)\}\frac{\sqrt{2}}{2}$.

Claim **11**. (currently amended) A method for measuring the refractive index difference Δn of two fluids of refractive indices n_2 and $n_2+\Delta n$, respectively, to first order in $\beta-\frac{\pi}{4}$ and second order in Δn using the improved refractometer cell of Claim **12** comprising the steps of

A. filling the first chamber **(4)** with said fluid of refractive index n_2 and the second chamber **(6)** with said second fluid of refractive index $n_2 + \Delta n$;

B. measuring the deflection angle ψ of the emerging beam;

C. calculating Δn from the relation:

$$\sin(\psi)=2\Delta n\left\{1+\left(1-\frac{n_g}{n_2}\right)\left(\beta-\frac{\pi}{4}\right)\right\}+2\left(n_g-n_2\right)\left(\beta-\frac{\pi}{4}\right)+\Delta n^2\left\{\left(11\frac{n_g}{n_2^2}-\frac{1}{n_g}-\frac{10}{n_2}\right)\left(\beta-\frac{\pi}{4}\right)-\frac{1}{n_2}\right\}$$

where n_g is the refractive index of said transparent cell.

Claim **12**. (new) An improved refractometer cell constructed of a transparent material of refractive index n_g and comprising

A. a first exterior surface (**9**) and a second exterior surface (**14**), said first and second exterior surfaces (**9, 14**) permitting a light beam (**1**) to pass therethrough so as to enter and exit, respectively, the refractometer cell, and

B. a pair of fluid-containing chambers (**4, 6**) through which said light beam passes, said chambers (**4, 6**)

1) each forming a cavity which contains at least two plane, non-parallel surfaces (**10, 11** and **12, 13**);

2) are separated by a transparent window therebetween;

3) contain fluids of refractive index n_1 and n_2 respectively, and;

4) are characterized in that said chambers comprise entrance and exit beam-passing plane surfaces (**10, 11, 12, 13**), at least one of which has no other internal beam-passing surface parallel thereto.

Claim **13**. (new) The improved refractometer cell of Claim **12** further incorporating mirror means (**15**) adjacent and parallel to said second exterior surface (**14**) causing the beam transmitted therethrough to be reflected back therefrom through said cell and exiting at said first exterior surface (**9**), where its angular deviation relative to the direction of said incident light beam (**1**) may be measured thereat.

Claim **14**. (new) The improved refractometer cell of Claim **12** wherein the sides transverse to the incident beam of each chamber (**4, 6**) form a triangle.

Claim **15**. (new) The improved refractometer cell of Claim **14** wherein said first chamber (**4**) forms an isosceles right triangle of 45° base angles (α), said second chamber (**6**) forms a triangle with one 45° base angle (α) and a second angle (β) less than 45° yielding a third angle greater than a right angle, and the hypotenuse (**11**) of the isosceles right triangle of said first chamber (**4**) is parallel to the longest side (**12**) of the triangle of said second chamber (**6**).